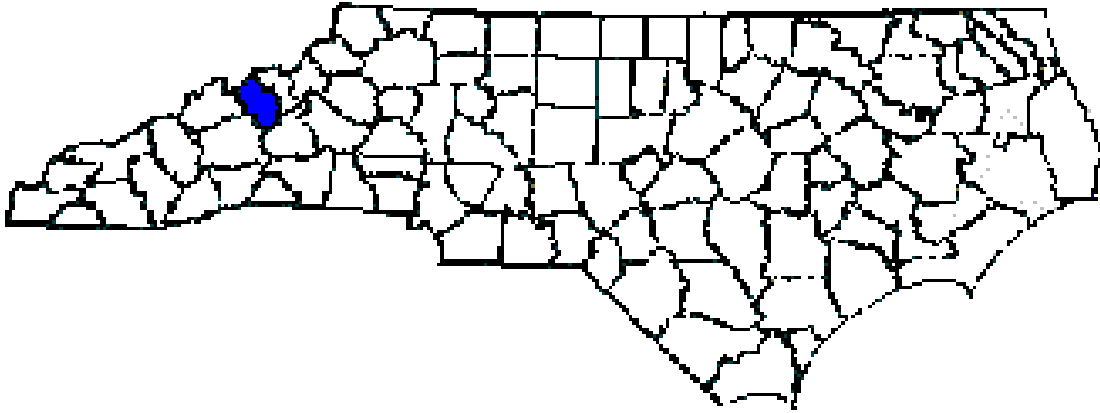


# ANNUAL REPORT FOR 2014



**Bald Creek Site #4 Mitigation Site**  
**Yancey County**  
**TIP No. R-2518B**  
**COE Action ID: SAW-2007-2197-357/300**  
**DWR #: 20071134**



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December 2014

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## **SUMMARY**

The following report summarizes the stream monitoring activities that have occurred during the Year 2014 at the Bald Creek Site #4 Mitigation Site in Yancey County. The North Carolina Department of Transportation (NCDOT) completed this project in June 2009. This report provides the monitoring results for the fifth formal year of monitoring (Year 2014). The Year 2014 monitoring period was the fifth of five scheduled years of monitoring on the Bald Creek Site #4 Mitigation Site (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring at Bald Creek Site #4, it has met the required monitoring protocols for the fifth formal year of monitoring on the stream and third formal year of monitoring on the planted vegetation. It was agreed by the Regulatory Agencies and NCDOT during the March 25, 2014 Annual Monitoring Meeting that the longitudinal profile could be discontinued for the remainder of the five year monitoring period due to heavy vegetation within the channel. In lieu of doing the longitudinal profile, visual inspection of the channel stability throughout the reach and photo documentation at the permanent photo point locations would be completed. All other monitoring activities will continue to be completed throughout the five year monitoring period. The channel throughout the stream enhancement site is stable at this time. The streambank and buffer area were planted in March 2012 with live stakes and bareroot seedlings. The planted vegetation is surviving at this time.

NCDOT proposes to discontinue stream monitoring but will continue vegetation monitoring at the Bald Creek Site #4 Mitigation Site until 2016.

## **1.0 INTRODUCTION**

### **1.1 Project Description**

The following report summarizes the stream monitoring activities that have occurred during the Year 2014 at the Bald Creek Site #4 Mitigation Site. Site #4 is located on US 19 in Yancey County at Sta. 135+60 to Sta. 138+05 -L- (Figure 1). The Bald Creek Site #4 was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2518B in Yancey County.

The mitigation site provided approximately 814 linear feet of stream enhancement. Construction was completed during June 2009 by the North Carolina Department of Transportation (NCDOT). Stream enhancement involved installing several in-stream cross vane structures and planting the riparian buffer zone. A rock vane structure with some root wads was installed on the left bank in the only bend along this reach.

### **1.2 Purpose**

In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2014 at the Bald Creek Site #4 Mitigation Site. Hydrologic monitoring was not required for this site.

### **1.3 Project History**

June 2009	Construction Completed
October 2009	As-Built Survey Completed
February 2010	Site Planted (Type I only)
November 2010	Stream Channel Monitoring (Year 1)
November 2011	Stream Channel Monitoring (Year 2)
March 2012	Site Planted (Type I and II)
September 2012	Vegetation Monitoring (Year 1)
November 2012	Stream Channel Monitoring (Year 3)
March 2013	Bankfull Monitoring Gauge Installed
August 2013	Vegetation Monitoring (Year 2)
November 2013	Stream Channel Monitoring (Year 4)
July 2014	Vegetation Monitoring (Year 3)
November 2014	Stream Channel Monitoring (Year 5)

### **1.4 Debit Ledger**

The entire Bald Creek Site #4 stream mitigation site was used for the R-2518B project to compensate for unavoidable stream impacts.





**Figure 1. Vicinity Map**



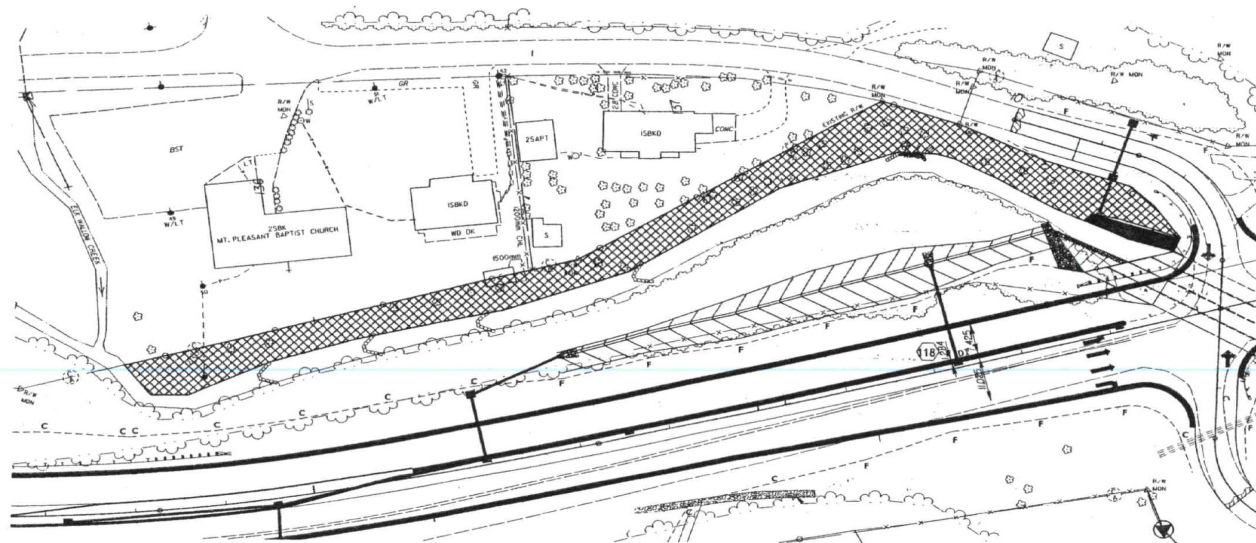


## 0.21 HECTARE STREAMBANK REFORESTATION



PROJECT REFERENCE NO. R-2548B	SHEET NO. EC-56/CONST 10
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

STA. 135+40 to STA 138+00



SEE RF-2, RF-3 AND PROJECT SPECIAL PROVISIONS

Figure 3. Site #4 Reforestation Plan

## **2.0 STREAM ASSESSMENT**

### **2.1 Success Criteria**

The permittee shall monitor the restoration and enhancement mitigation sites following the Level 1 protocols outlined in the "Stream Mitigation Guidelines," dated April 2003 with the following exceptions:

1. Pebble counts shall not be conducted.
2. Two cross sections shall be conducted for streams less than 500 linear feet and five (5) cross sections shall be conducted for streams greater than 500 linear feet.
3. Riparian success shall be by visual inspection of plant survival. Photos will be taken and comments noted on plant survival.

The permittee shall monitor the preservation sites by visual inspection. Photos will be taken and comments noted on plant survival. The monitoring shall be conducted annually for a minimum of five (5) years after final planting. The monitoring results shall be submitted to DWR in a final report within sixty (60) days after completing monitoring. After 5 years the NCDOT shall contact the DWR to schedule a site visit to "close out" the mitigation site.

### **2.2 Stream Description**

#### ***2.2.1 Post-Construction Conditions***

The enhancement of Bald Creek Site #4 Mitigation Site involved installing several in-stream cross vane structures and planting the riparian buffer zone. A rock vane structure with some root wads was installed on the left bank in the only bend along this reach.

#### ***2.2.2 Monitoring Conditions***

The objective of the Bald Creek Site #4 stream enhancement was to enhance a C4 stream as identified in Rosgen's Applied River Morphology. A total of four cross sections (two in a riffle and two in a pool) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology presented below in Table 1 (Site #4).

**Table 1. Abbreviated Morphological Summary (Bald Creek Site #4)**

Variable	Proposed	Cross-Section #2 (Riffle)	Cross-Section #3 (Riffle)	Min. – Max Values (Riffle Sections Only)
		2014	2014	2014
Drainage Area (mi <sup>2</sup> )	8.4	8.4	8.4	8.4
Bankfull Cross Sectional Area (ft <sup>2</sup> )	50	42.53	20.88	20.88 – 42.53
Maximum Bankfull Depth (ft)	2.6	3.03	2.09	2.09 – 3.03
Width of the Floodprone Area (ft)	> 50	38	30.17	30.17 – 38
Bankfull Mean Depth (ft)	2	1.61	1.54	1.54 – 1.61
Width/Depth Ratio	14	16.44	8.79	8.79 – 16.44
Entrenchment Ratio	> 3.0	1.44	2.23	1.44 – 2.23
Bankfull Width (ft)	25.2	26.47	13.53	13.53 – 26.47

\* Riffle values are used for classification purposes, pool values are shown in Appendix A.

## 2.3 Results of the Stream Assessment

### 2.3.1 Site Data

The assessment included the survey of four cross sections and the longitudinal profile of Bald Creek Site #4 established by NCDOT after construction. The length of the profile along Bald Creek Site #4 was approximately 400 linear feet. Four cross sections were established during the as-built monitoring year. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The location of the cross sections and longitudinal profile are shown in Appendix A.

Bald Creek Site #4 Cross-Sections:

- ◆ Cross-Section #1: Bald Creek Site #4, Station 113+04, midpoint of pool
- ◆ Cross-Section #2: Bald Creek Site #4, Station 181+00, midpoint of riffle
- ◆ Cross-Section #3: Bald Creek Site #4, Station 387+05, midpoint of riffle
- ◆ Cross-Section #4: Bald Creek Site #4, midpoint of pool

Based on comparisons of the As-Built data to monitoring data, all of the cross sections appear stable with little or no active bank erosion. Graphs of the cross sections are presented in Appendix A. Future survey data will vary depending on actual location of rod placement and alignment; however, this information should remain similar in appearance.

It was agreed by the Regulatory Agencies and NCDOT during the March 25, 2014 Annual Monitoring Meeting that the longitudinal profile could be discontinued for the remainder of the five year monitoring period due to heavy vegetation within the channel. In lieu of doing the longitudinal profile, visual inspection of the channel stability throughout the reach and photo documentation at the permanent photo point locations would be completed. All other monitoring activities will continue to be completed throughout the five year monitoring period. A beaver dam downstream of Cross Section #4 is forcing water to flow into the right bank but overall, the stream is stable. USDA has been contacted to remove the beavers and dam from the stream. Pebble counts were not required per the permit conditions and therefore were not completed. Multiple bankfull events were documented by a surface water gauge at Site 4 during the 2014 monitoring year.



### **3.0 VEGETATION: BALD CREEK SITE #4**

#### **3.1 Description of Species**

The following tree species were planted on the streambank:

*Salix nigra*, Black Willow

*Cornus amomum*, Silky Dogwood

The following tree species were planted in the buffer area:

*Liriodendron tulipifera*, Yellow Poplar

*Platanus occidentalis*, Sycamore

*Fraxinus pennsylvanica*, Green Ash

*Quercus alba*, White Oak

#### **3.2 Results of Vegetation Monitoring**

**Streambank & Buffer Vegetation:** The streambank reforestation was completed in March 2012. The Year 3 vegetation monitoring evaluation noted: Type I: Black Willow, Silky Dogwood and Type II: Sycamore, Green Ash, Tulip Poplar, and White Oak were surviving at the time of the monitoring evaluation.

#### **3.3 Conclusions**

NCDOT will continue to monitor the planted vegetation in 2015.

### **4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS**

The Bald Creek Site #4 Mitigation Site has met the required monitoring protocols for the fifth formal year of monitoring on the stream and the third formal year of monitoring on the planted vegetation. The channel throughout the stream enhancement site is stable and the planted vegetation is surviving at this time. NCDOT proposes to discontinue stream monitoring but will continue vegetation monitoring at the Bald Creek Site #4 Mitigation Site until 2016.

## **5.0 REFERENCES**

Stream Mitigation Plan, US Highway 19, R-2518B On-Site Mitigation  
Yancey County, North Carolina, February 2007.

Stream Mitigation Plan Sheets for R-2518B, US 19 from east of the Madison  
County line to SR 1336, Stream Mitigation (Preservation, Enhancement,  
and Restoration), Buck Engineering.

North Carolina Department of Transportation (NCDOT), April 29, 2008. 404 and  
401 Individual Permits for R-2518A and R-2518B (ACOE Permit No. 2007-  
2197-357/300 and DWR Project No. 20071134, Individual Certification No.  
3706).

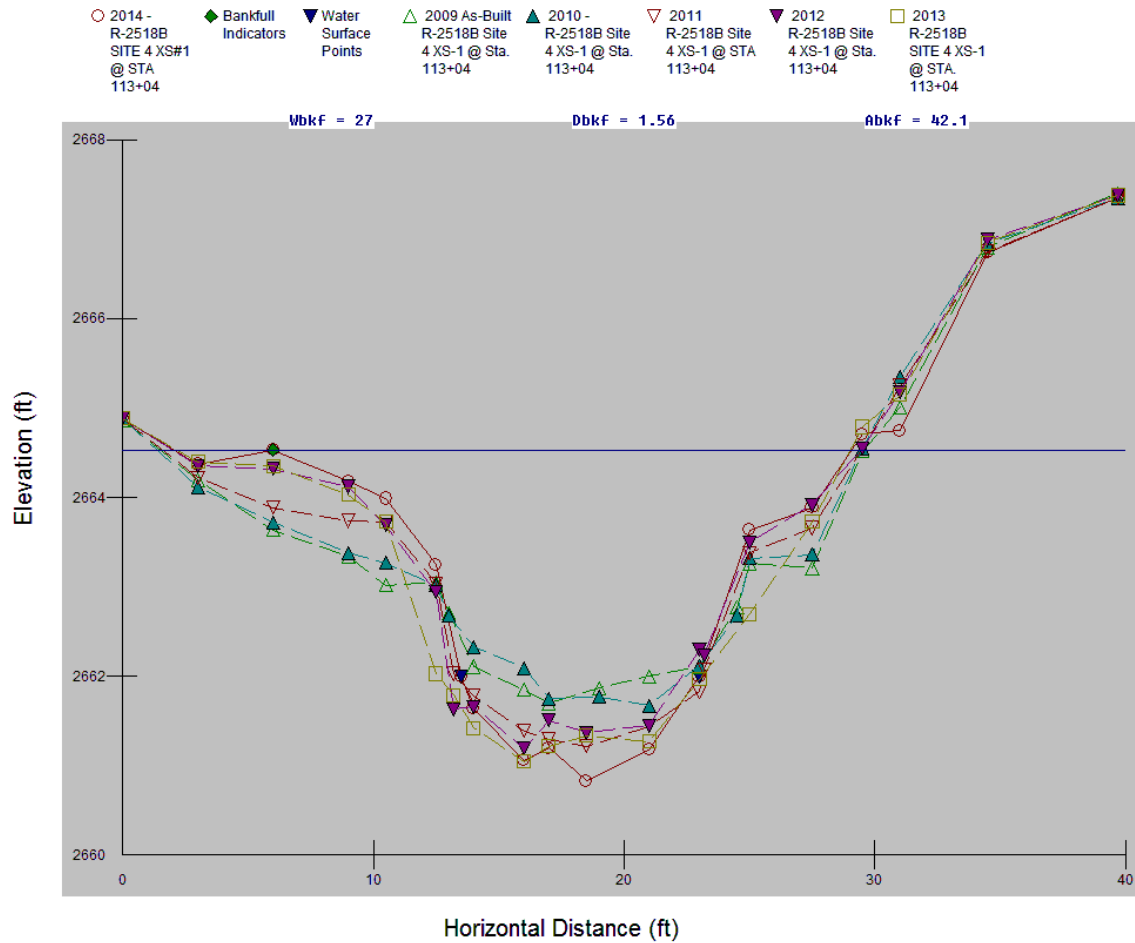
Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa  
Springs, Colorado.

US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines.  
Prepared with cooperation from the US Environmental Protection Agency,  
NC Wildlife Resources Commission, and the NC Division of Water Quality.



**APPENDIX A**  
**CROSS SECTIONS**

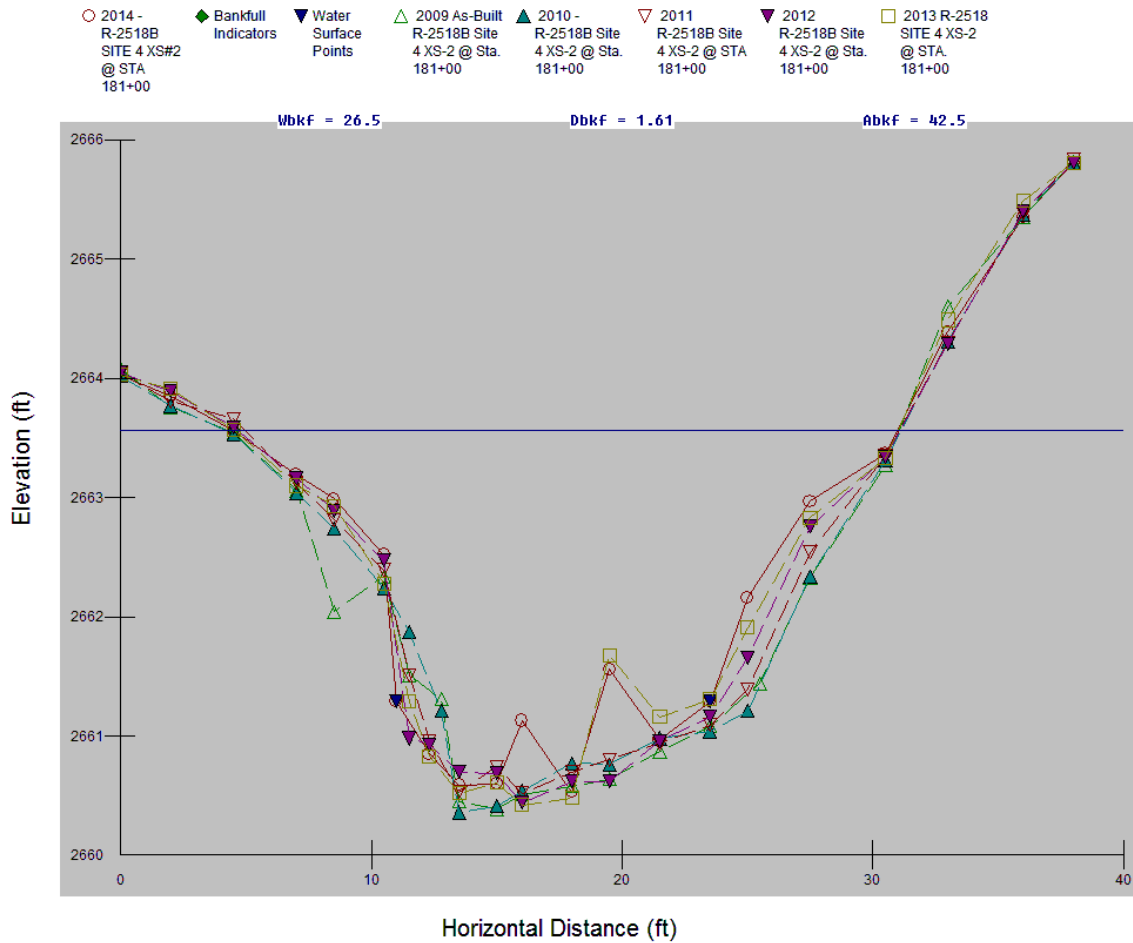
# R-2518B SITE 4 XS#1 @ STA 113+04



Site #4: Cross-Section #1 (Pool) Abbreviated Morphological Summary*					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	54.78	56.12	52.46	57.19	41.83
Maximum Bankfull Depth (ft.)	3.22	3.67	3.7	3.84	3.7
Bankfull Mean Depth (ft.)	1.82	1.86	1.73	1.91	1.81
Bankfull Width (ft.)	30.14	30.23	30.31	29.92	23.06

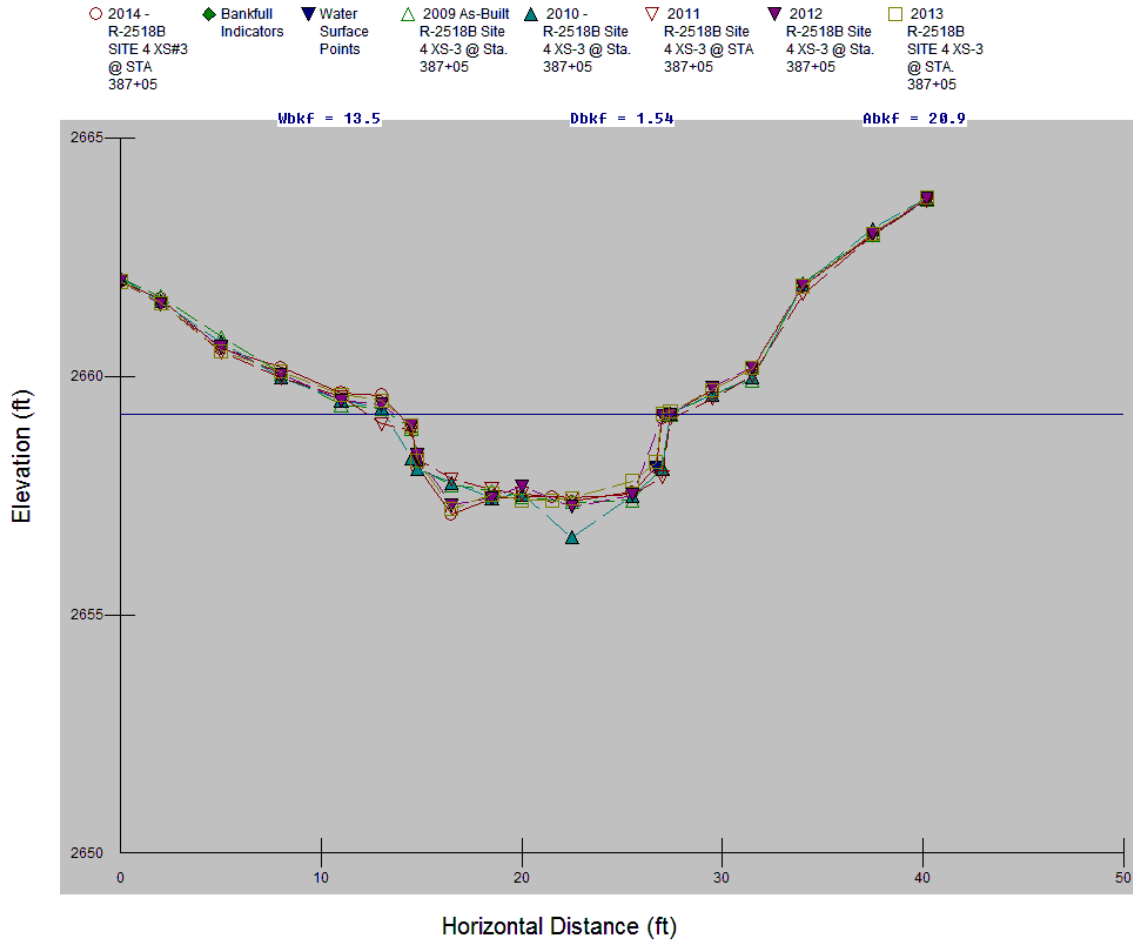
\* According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.

## R-2518B SITE 4 XS#2 @ STA 181+00



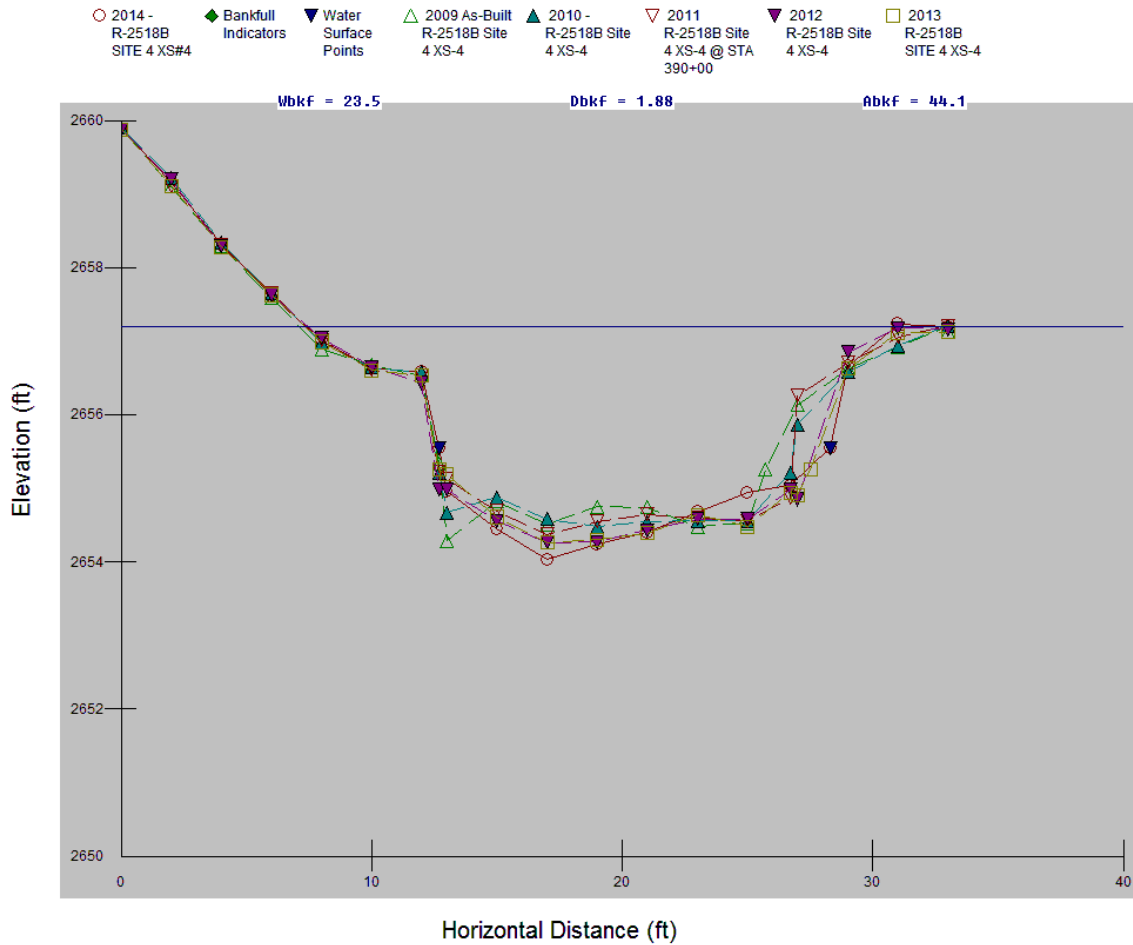
Site #4: Cross-Section #2 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	47.84	50.03	47.53	44.6	42.53
Maximum Bankfull Depth (ft.)	3.17	3.14	3.15	3.15	3.03
Width of the Floodprone Area (ft.)	38	38	38	36	38
Bankfull Mean Depth (ft.)	1.8	1.87	1.78	1.68	1.61
Width/Depth Ratio	14.75	14.34	14.98	15.79	16.44
Entrenchment Ratio	1.43	1.42	1.43	1.36	1.44
Bankfull Width (ft.)	26.55	26.82	26.66	26.52	26.47

# R-2518B SITE 4 XS#3 @ STA 387+05



Site #4: Cross-Section #3 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	23.26	18.56	19.61	20.6	20.88
Maximum Bankfull Depth (ft.)	2.6	1.66	1.93	2.04	2.09
Width of the Floodprone Area (ft.)	32.87	28.38	29.56	30.43	30.17
Bankfull Mean Depth (ft.)	1.63	1.26	1.43	1.5	1.54
Width/Depth Ratio	8.73	11.74	9.57	9.17	8.79
Entrenchment Ratio	2.31	1.92	2.16	2.21	2.23
Bankfull Width (ft.)	14.23	14.79	13.68	13.75	13.53

# R-2518B SITE 4 XS#4



Site #4: Cross-Section #4 (Pool) Abbreviated Morphological Summary*					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	42.48	41.78	43.36	42.64	44.12
Maximum Bankfull Depth (ft.)	2.73	2.84	2.9	2.86	3.16
Bankfull Mean Depth (ft.)	1.65	1.63	1.86	1.68	1.88
Bankfull Width (ft.)	25.69	25.6	23.29	25.41	23.46

\* According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.

**APPENDIX B**  
**SITE PHOTOGRAPHS**



# Bald Creek Site #4



Photo Point #1 (Upstream)



Photo Point #1 (Downstream)



Photo Point #2 (Upstream)



Photo Point #2 (Downstream)



Photo Point #3 (Upstream)



Photo Point #3 (Downstream)

November 2014



# Bald Creek Site #4



Photo Point #4 (Upstream)



Photo Point #4 (Downstream)



Beaver dam downstream of Cross Section #4  
November 2014



# Bald Creek Site #4



Vegetation Overview Photo



Vegetation Overview Photo

July 2014